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Protecting the health of vulnerable people from the humanitarian consequences of climate change and climate related disasters

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EXECUTIVE SUMMARY

The health and humanitarian dimensions of climate change are among the ultimate justifications for taking action on climate change and these are closely interlinked. Humanitarian assistance provides a strong health imperative to save lives and alleviate the suffering of crisis affected populations. Climate change mitigation and adaptation, in particular, are important for the protection of health of vulnerable populations from both sudden and slow onset climate-related emergencies.

The aim of the paper is twofold: first, it documents the range of risks that climate change poses to human health associated with humanitarian emergencies, and secondly, it proposes policy directions to manage the health humanitarian impact of climate change for consideration by the 15th Conference of the Parties (COP) to the UNFCCC, the health sector and by the humanitarian community.

Comprehensive long-term cooperative actions are needed to formulate clear responses in order to protect and enhance human health and well-being from the risks of climate change, including humanitarian emergencies. Relevant actions are specified under the headings of climate strategies outlined in the Bali Action Plan, including shared vision, mitigation, adaptation, finance and technology. The most immediate actions for minimizing health humanitarian impacts from climate change are in the field of adaptation, and include 1) strengthening of public health systems, 2) enhancing capacity to address public health emergencies, 3) strengthening surveillance and control of infectious disease, 4) improving the use of early warning systems by the health sector, and 5) enhancing local public health interventions to enhance community resilience to climate-change and climate-related disasters.

This paper has been developed within the framework of the Inter-Agency Standing Committee (IASC)[a] Task Force on Climate Change by the World Health Organization (WHO), in collaboration with IOM/WV/UNHCR/IFRC [b] and in consultation with the United Nations International Strategy for Disaster Reduction system.

1. Introduction to Climate Change, Disasters and Health

The health of millions of people is impacted each year by the acute and long-term effects of climate, including humanitarian emergencies. Climate change is happening now and it inevitably affects the

[a] The Inter-Agency Standing Committee (IASC) is the primary mechanism for inter-agency coordination of humanitarian assistance. It is a unique forum involving the key UN and non-UN humanitarian partners

[b] IOM: International Organization for Migration; WV: World Vision; UNHCR: United Nations High Commissioner for Refugees; IFRC: International Federation of Red Cross and Red Crescent Societies.

basic requirements for health: clean air and water, sufficient food and adequate shelter. Each year, about 800 000 people die from causes attributable to urban air pollution, 2.2 million from diarrhoea, (largely resulting from lack of access to clean water supply sanitation and poor hygiene), 3.5 million from malnutrition and approximately 60 000 in climate-related disasters[1-4], mostly in low resource settings and highly prevalent in humanitarian settings. Climate change will lead to higher levels of some air pollutants, increased outbreaks and transmission of diseases through unclean water and through contaminated food, threaten agricultural production in some of the poorest countries, and an increasing number of extreme weather events.

Climate change also brings new challenges to the control of infectious diseases. Many of the major killers are highly climate-sensitive to temperature and rainfall, including cholera and the diarrhoeal diseases, as well as vector borne diseases including malaria, dengue and schistosomiasis.

Diminished resources, such as food and water, also has the potential to increase competition leading to conflict and ultimately to humanitarian crises. Such stresses may also lead to forced migration, increasing risks of transmission of communicable diseases and burdens on health systems, and further aggravating tensions between communities[5]. In sum, climate change threatens to reverse the progress that the global public health community has been making against many diseases, and increase the challenges for the humanitarian community to respond to natural, biological and social emergencies. It also presents an opportunity to health and humanitarian sectors to galvanize a common understanding and approach for countermeasures which reduce the impact of emergencies on the health of affected communities.

2. Health impact of climate-related disasters

Globally, the number of reported weather-related natural disasters is increasing. Reports of natural catastrophes have more than tripled since the 1960s. In 2007, 14 out of 15 appeals for emergency humanitarian assistance were for floods, droughts and storms – five times higher than in any previous year.[6]

2.1 Acute stresses

More numerous reports of climate disasters are partly due to population growth in high-risk areas, but it is likely that climate change is also a contributing factor. The last few decades have seen rapid growth in populations living in flood plains and coastal areas, particularly in developing country cities, placing more people in the path of weather-related disasters. At the same time, climate change has driven extreme high temperatures and has probably contributed to more frequent and extreme precipitation events and more intense tropical cyclone activity.[7] Together, these trends will increase weather-related hazards to human health.

Extreme heat. Studies have shown that daily temperatures above a locally specific threshold result in higher mortality rates. The hot summer of 2003 in Europe produced sustained record high temperatures which resulted in markedly higher death rates, particularly among the elderly population. In total, it has been estimated that 70 000 more deaths occurred in western Europe during that extreme summer than expected.[8] Continuing global warming and possible increases in temperature variability[9] will make such events more frequent and more severe. It is projected that European summer temperatures as high as those experienced in 2003 may be the norm by the middle of the century.[10]

Floods and droughts. Even small changes in average precipitation can have a very large effect on the extremes of rainfall events that cause either flooding or drought, already the most frequent and deadly forms of disasters. For example, studies have shown that human influence on the global climate is likely to make what would currently be considered a “very wet winter” in the United Kingdom, or a “very wet summer” in the South Asian monsoon region, about five times more frequent by the second half of this

century.[11] Floods cause drowning and physical injuries; heighten the risk of diseases transmitted through water, insect vectors and rodents; damage homes; and disrupt the supply of essential medical and health services. The number of floods reported globally is rising rapidly – much more rapidly than disasters unrelated to climate.

Globally, climate change is likely to widen the area affected by drought, with particularly severe impacts in areas that are already water-stressed. These trends will impact on lives and on health. Droughts increase the risk of water and food shortages and malnutrition, and diminished health among vulnerable population. They also increase the risk of diseases spread by contaminated food and water. The combination of extreme heat and drought are also important risk factors for causing wildfires, resulting in direct health and economic losses, and increased risk of respiratory illness due to smoke pollution.

Tropical storms. Extreme winds, particularly in the tropical regions, bring death, illness, injury, psychosocial impacts, and destruction of health facilities and health services. There is evidence of a marked increase in the numbers of the most extreme cyclones in recent decades, and this trend is likely to continue. Studies suggest that a doubling of the level of carbon dioxide in the atmosphere would result in an increase of only about 6% in average cyclone windspeed but of 300% in the frequency of the largest (category 5) storms.[12]

Changing patterns of infection. Infections caused by pathogens that are transmitted by insect vectors are strongly affected by climatic conditions such as temperature, rainfall and humidity. These diseases include some of the most important current killers: malaria, dengue and other infections carried by insect vectors, and diarrhoea, transmitted mainly through contaminated water. Populations in crisis situations, in particular, face heightened risk of these illnesses.

Malaria transmission is strongly affected by climate. Transmitted by *Anopheles* mosquitoes, malaria is the most important vector-borne cause of mortality globally. It kills almost 1 million people each year, mainly poor children in Africa.[13] Malaria is strongly influenced by climatic conditions; it is not transmitted in the cooler temperatures associated with high altitudes and latitudes, and the number of mosquito vectors depends on the availability of freshwater breeding sites. Warmer temperatures, higher humidity and more places where water can collect generally favour malaria transmission. There is evidence that in some sites in the highlands of East Africa, a warming trend over the last 30 years has improved conditions for mosquitoes, increasing the probability of malaria transmission and highland epidemics.[14]

Dengue prevalence is increasing rapidly. Transmitted by *Aedes* mosquitoes, dengue is a fast growing challenge, particularly in tropical cities in developing countries. Cases have risen dramatically in the last 40 years, as unplanned urbanization with standing water in waste and other receptacles have created mosquito breeding sites, and movement of people and goods has spread both mosquito vectors and infections. Climate trends may also have played a role, since the distribution of dengue is also highly dependent on climate.[2]

Diarrhoea remains one of the biggest killers of children. Viruses and bacteria transmitted through water and contaminated food can cause severe diarrhoea in children, often locking them into a vicious cycle of undernourishment, susceptibility to other infectious diseases, and eventually death. Higher temperatures and too much or too little water can each facilitate transmission of this disease. In countries with inadequate water and sanitation services, diarrhoea is much more common when temperatures are high. For example, rates of diarrhoeal disease in Lima, Peru, are 3–4 times higher in the summer than in the winter, increasing by 8% for every 1 °C increase in temperature.[15] Both flooding and unusually low levels of water can also lead to water contamination and bring higher rates of illness and death from diarrhoea.[16] Warming and greater variability in precipitation threaten to increase the burden of this disease.

Many other diseases will also be affected. Any disease caused, transmitted or harboured by insects, snails and other cold-blooded animals can be affected by a changing climate. New and unfamiliar infections strain health services and economies. When infectious diseases appear in new locations, where people do not have immunity and health services may not have experience in controlling or treating infections, the effects can be dramatic. In severe or unusual outbreaks, the cooperation of community, national and international epidemic and emergency response systems will be required to control the spread of disease, provide emergency health services to the affected population and help manage the widespread societal and economic aspects through coordinated multi-sectoral action..

2.2 Chronic stresses: water shortages, malnutrition, psychosocial stress, displacement, migration and conflict

In the long run, the greatest health impacts may not be from acute shocks such as disasters or epidemics, but from the gradual increases in pressure on the natural, economic and social systems that sustain health which are already under stress. These gradual stresses include reductions and seasonal changes in the availability of fresh water, regional drops in food production, and rising sea levels. The effects of climate change on ongoing conflicts (such as the Darfur crises) is also a critical concern of the health humanitarian community.

Each of these changes has the potential to cause, prolong and exacerbate chronic emergencies, including major population displacement, and increase the risks of civil conflict.

Mounting water stress fosters a range of long-term public health challenges. Lack of access to clean water supply and sanitation, along with poor hygiene, is already the main contributor to the burden of diarrhoeal disease.[17] Climate change is projected to bring changing rainfall patterns, increased temperatures and evaporation, and salinization of water sources through rising sea levels. In addition, over the course of the century, water supplies stored in glaciers and snow covers are projected to decline. This will reduce water availability to populations supplied by melt-water from major mountain ranges, more than one sixth of the global population. The Himalayas glaciers, whose melt waters serve 1.3 billion people, are showing a rate of recession greater than anywhere else in the world. [i]In many regions, the effects of climate change come on top of pre-existing water stress and mounting pressures of population growth, as well as extraction for irrigation and contamination from agriculture and industry.[18]

Pressures on agriculture threaten to increase the burden of malnutrition. Undernutrition and related disease is currently the greatest contributor to the global burden of disease, killing over 3.5 million people per year, mostly children in developing countries.[4] It is projected that climate change will boost agricultural production in the high latitudes of developed countries, but cause decreases in many tropical developing regions. There is particular concern for sub-Saharan Africa, where people are most reliant on subsistence and rain-fed agriculture and have least money to buy imported food. Some studies agree that higher temperatures and longer growing seasons could result in increased pest populations in temperate regions of Asia[19]. Increased frequency of El Niño events and future changes to the ocean ecology have the potential to substantially alter fish breeding habitats and food supply for fish, and ultimately the abundance of fish populations. Tens of millions more people are projected to become at risk of food insecurity and the health consequences of malnutrition.[18]

Population displacement compromises health and damages lives. By destroying ecological and agricultural systems and by flooding communities, climate change can eventually force people to abandon where they live in order to seek new homes and livelihoods. Forced displacement is associated with a range of health issues, including social isolation and mental disorders and, in many cases, reduced socioeconomic status and associated health problems. When migration crosses ethnic and/or national boundaries, such as forced migration from low-lying, small island states, the social transition is more difficult and the associated health effects are likely to be more severe. Refugee or displaced persons camps are often sited on marginal lands which may provide breeding sites for disease vectors (Malaria,

Dengue). Population movement may take refugees and displaced through or to areas of higher malaria endemicity than their place of origin.

Environmental pressures exacerbate pre-existing problems and accentuate underlying social fault lines. Economically and socially marginalized groups within society will be worst affected. Migrants can also experience increased vulnerability post-disaster due to compromised access to services in the affected areas as well as potential language and cultural barriers. For irregular migrants and migrants who have lost their documents as a result of the disaster access to assistance might be particularly difficult.[20,21]

Competition over dwindling or degraded natural resources can increase the risks of conflict and war. Although most conflicts are not directly related to natural resources, stresses on natural ecosystem services can lead to competition between population groups over, for example, freshwater supplies or fertile agricultural land. Combined with factors such as poor governance and ethnic rivalries, such competition can inflame tensions into conflict.[22]

3.2 Vulnerable regions: exposed populations

All regions of the world will be affected by a changing climate, but the resulting health risks to human populations vary greatly, depending on where and how people live. People living in small island developing states and other coastal regions, megacities and mountainous and polar regions are all particularly vulnerable in different ways.[18]

Small island developing states and other low-lying regions are in the front line. Populations in these countries are vulnerable to death and injury and destruction of their public health infrastructure from increasingly severe tropical storms, as well as salinization of water resources and agricultural land from sea level rise.[23] Many of these nations struggle to supply adequate fresh water for basic sanitation and hygiene, particularly to outlying islands and other isolated areas where populations suffer elevated rates of diarrhoea and nutritional deficiencies during droughts, floods and high temperatures[16]. Displacement of populations from small island development states is expected to increase due to these climate-related impacts on basic resources.

Urban populations, particularly those of tropical megacities, are exposed to a combination of health risks such as heatwaves, floods, infectious diseases and air pollution. Rising global temperatures combine with the urban heat island effect, and can raise temperatures by 5–12^{o} C, heightening hazards from heatwaves.[24,25] Extensive coverage with impervious surfaces, along with inadequate drainage and precarious housing, increase the risks and the health impacts of flash floods. High population densities, inadequate coverage of clean water, sanitation and waste disposal services raise vulnerability to climate-sensitive infectious diseases such as diarrhoea and dengue. Many cities also have high levels of air pollution, almost all of which results from burning of fossil fuels.[26] These factors accentuate the risk of emergencies requiring local and national response, and increased prospect of international assistance.

Mountain populations are vulnerable, due to high exposure to hazards, remoteness, poor infrastructure and marginalization. at increased risk of water insecurity, floods and landslides, and infectious disease. Climate change at high altitudes can cause a range of health challenges.[27] The widespread retreat of glaciers threatens to deprive mountain and downstream populations of reliable summer fresh water for household use and for agriculture, from China to Peru. Swelling of the lakes that form at the bottom of glaciers increases the risks of glacier lake outburst floods, which occur suddenly and can cause injury, death and destruction in downstream communities. Furthermore, higher temperatures are intensifying the risks of transmission of vector-borne diseases, such as malaria, among high-altitude populations that lack immunity against such diseases.[14] While trying to cope, nomad populations may need to become sedentary - already occurring with some groups in the Northern Himalayas - and traditional ethnic groups may thus face social tensions and eventual loss of their identity. The psychosocial stress may result in depression, leading to misuse of alcohol, domestic violence and other dramatic and negative behavioural changes.

The health of indigenous people in polar regions may be particularly affected by changes in temperature, food sources and livelihoods. Rising winter temperatures in Arctic regions are expected to reduce excess winter mortality and cold-related injuries.[28] However, the traditional diet of circumpolar residents is likely to be impacted by melting snow and ice, affecting animal distributions and accessibility for hunting. Wildlife and waterborne and vector-borne diseases are expected to have a wider seasonal and geographical distribution.[29] Perhaps most importantly, changes in the physical environment will make traditional ways of life impossible, forcing changes of behaviour and means of supporting livelihoods, with associated effects on mental health and community cohesion, and displacement of populations.

Women and children in developing countries are particularly vulnerable to death and illness following disasters. In the 1991 cyclone disasters that killed 140 000 people in Bangladesh, death rates among women were almost four times greater than those among men: rates among children under 10 years of age were more than six times greater than those of adult men.[30] Disasters can also result in increased suffering from domestic violence and post-traumatic stress disorders in women,[20,21] who are also often called upon to play a leading role in disaster recovery and in rebuilding shattered communities.

3. Solutions: health governance, humanitarian assistance and the climate change agenda

Climate change will affect the health and well-being of all populations, with impacts escalating into the foreseeable future in many different ways. Human health and wellbeing are central to humanitarian, environment and development policy.

We have outlined the range of risks that climate change poses to human health, with a focus on those risks that can cause emergencies and displacement.. The extent to which these risks translate into increased numbers of deaths and burdens of injury and disease will depend on the effectiveness of mitigation and adaptation policies. Strengthening public health systems and health emergency management systems is necessary, particularly to safeguard the health of the most vulnerable population groups and respond effectively to emergencies when they arise. This principle has been outlined in frameworks for action developed by individual countries and in regions during the past two years, for example in the Asia Pacific Region where over 3 billion people live[31].

3.1 Actions to improve our health and protect our climate

The global public health community has a wealth of experience in protecting people from climate-sensitive hazards. Many of the necessary preventive actions to deal with the additional risks of climate change are already clear. Widening the coverage of proven, effective health interventions will be critical to the global effort to adapt to climate change.

Strengthening of public health systems is necessary with or without climate change; climate change makes this need even more critical and urgent. Today's shortfalls in providing basic public health services leave much of the global population exposed to climate-related health risks. There is a need for additional investment to strengthen key health functions and for forward planning to address the new challenges posed by climate change. This should include increase capacity of the health system to extend services and continuity of care to mobile, hard-to-reach populations and newly established communities after displacement, bridging emergency relief and long-term sustainability. To this effect, coherent partnership needs to be strengthened between humanitarian actors, NGOs, private sector, and national health systems through emergency preparedness measures in advance of any emergency, and be maintained from the very on-set of the emergency and throughout the community recovery and stabilization phase[32].

Enhanced capacity to address public health emergencies saves lives and protects communities. Acute shocks such as extreme weather events and disease epidemics can overload the capacities of health systems in even the most developed nations. Complex emergencies, resulting in humanitarian crises, result in enormous health burdens for the affected population, and often require wide-scale international assistance. As far as natural hazards are concerned, the number of disasters reported and the numbers of people affected have risen in recent decades, thus creating additional demands on health systems. Conversely, the number of people killed has fallen, as societies and individuals have become more able to protect themselves. Further reinforcing health vulnerability and risk assessment, multi-sectoral disaster risk reduction, health emergency preparedness, early warning, and health action in emergencies can help to ensure that people are better protected from the increasing hazards of extreme weather and help communities recover faster following a disaster[3].

Strengthened surveillance and control of infectious disease can protect health from local to global scales. Effective disease surveillance and control become even more important under conditions of rapid environmental change and movement of people, disease vectors and infections. Rapid and accurate disease notification, in compliance with the International Health Regulations,[33] is the essential basis for planning disease control. Approaches such as Integrated Vector Management, which make the best use of proven interventions, such as bed nets, insecticide spraying and environmental management, to control malaria, dengue and other vector-borne tropical diseases, are relevant to humanitarian situations and protect against the effects of climate change.[34] Improving access to primary health care in humanitarian settings ensures faster treatment for patients, alleviating suffering and containing the risks of disease spread.

Extreme weather forecast and early warning. There is great potential for using meteorological information to enhance early warning and effective response over a range of time scales, from hours or days (for example for flood or heatwave warnings), to weeks (for seasonal epidemics of vector-borne disease), to months (seasonal forecasts of precipitation anomalies allowing planning for flooding or drought) or years (for drought and associated food insecurity). While not useful for operational decision making, climate change projections on a decadal time-scale can give indications of how hazards may change and enable longer term planning for changing risks, such as the selection of safe sites for the development of health infrastructure. However, there is a need for improved institutional arrangements to ensure that the roles of meteorological, humanitarian, health and other agencies are well-defined, that climate information products are demand driven, user friendly and relevant for operational decision making in health and other sectors, and that there is sufficient capacity for operational response. Efficiency can be improved by sharing of data sources, protocols and information across warning systems for different hazards.

Local public health interventions to build community resilience. Action on environmental and social determinants of health is critical to protecting populations from climate change in both emergency and non-emergency situations. For example, scaling up water and sanitation services and disinfection at the household level would immediately reduce diarrhoea and, at the same time, lessen the health impacts of decreasing and more variable water supplies before and during emergencies. Implementing participatory approaches such as the FAO's[c] concept of Farmer Field Schools to empower local communities to manage disease vectors in an integrated manner and thus increase their capacity to protect their health will increase climate resilience. [35] The benefits of such interventions are already several times greater than the costs, and the threat of climate change makes these preventive health measures as part of the humanitarian response an even wiser investment. Improving social welfare in emergency situations, particularly educating and empowering women in developing countries, is a fundamental requirement for improving health. It is also essential to strengthening community resilience to disasters and to climate change. Such strategies need to be flexible enough to take into account the diverse composition of modern communities, and include migrants and people from different ethnic and cultural groups, and with different health-seeking behaviour.

[c] Food and Agriculture Organization

4. Protecting the health of vulnerable people from the humanitarian consequences of climate change and climate related disasters: proposals to COP 15 negotiators for the roadmap of action

Action on climate change is necessary to avoid adverse impacts on human health and wellbeing, alongside damage to the environment and economic development. A greater appreciation of the human and humanitarian dimensions of climate change is necessary for both the development of effective policy and the mobilization of public engagement regarding the impacts of climate change. Mainstreaming of climate change is essential to development of health systems and planning for humanitarian emergencies.

Shared Vision

Climate change, and climate policies, will profoundly affect some of the most fundamental determinants of health (especially food and water security) which increase the risks of humanitarian emergencies and decrease the effectiveness of humanitarian response. Comprehensive long-term cooperative actions are needed to formulate clear responses in order to protect and enhance human health and well-being from the effects of climate change, including those giving rise to humanitarian emergencies. Climate strategies, including, adaptation, mitigation, finance and technology, should therefore properly address the health consequences of climate change, including death, injury, disease, disability, mental illness and displacement arising from extreme weather events, sea-level rise and conflict arising from diminished food and water security. These disaster risk reduction strategies should be combined with good governance and institutional strengthening, health risk identification, knowledge management and education, and preparedness for effective response and recovery – the five priority actions of the Hyogo Framework for Action of the UN International Strategy for Disaster Reduction (UN ISDR)[36] .

Adaptation

Adaptation policies and forward planning will be required to assess and cope with the threats posed by climate change and enhance capacity to deal with public health emergencies. This approach will need to strengthen the health coordination with the humanitarian sector, health emergency management systems, early warning systems related to the health consequences of climate change, and interventions to control neglected tropical diseases. The investment in hospitals, health facilities and other infrastructure should be protected from the long-term effects of climate change. Renewed emphasis should be placed on primary health care, and improving the environmental and social determinants of health, from provision of clean water and sanitation, to enhancing the welfare of women, especially in emergency situations. All adaptation measures are designed to build the resilience of nations and communities to disasters and negative health impacts attributable to climate change through awareness raising, capacity building on interventions and relevant research.

Adaptation and mitigation policies outside the health sector will also have major health implications. A common theme must be ensuring health equity and giving priority to protecting the health security of particularly vulnerable groups. Increased investment in health systems is already necessary in order to meet the health-related Millennium Development Goals, whose achievement will be further compromised by the impact of climate-related events.

Mitigation

Mitigation is essential to prevent continuing rises in the frequency and severity of extreme weather events. Parties are encouraged to continue to specify the avoidance of health and humanitarian disasters as a primary motivation for mitigating climate change.

Finance & Technology

Financial mechanisms and technological innovation to support action to strengthen health systems and health emergency management systems to reduce the impact of climate change should be accessible by the health and humanitarian sectors, both to support actions that provide opportunities for improving health and support programmes that help protect public health from the humanitarian consequences of climate change. The effects of climate change on health, the long-term risks stemming from drought and sea-level rise that could affect water and food security and safety, competition for resources, and displacement of populations with humanitarian needs, should all be integrated into early warning systems with appropriate evaluation schemes.

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